Massachusetts Perspectives on Perchlorate Regulation

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MassDEP Perchlorate MCL

- 0.0020 mg/L (2.0 ug/L)
- RfD of 7 x 10^{-5} mg/kg-day and RSC 20%
- Promulgated July 28, 2006
- Applicable to Community and Non-Transient, Non-Community Public Water Systems
- Effective January 1, 2007
- Compliance Based on the Average of an Initial and Confirmation Sample
- Violation Requires Tier 1 Public Notification

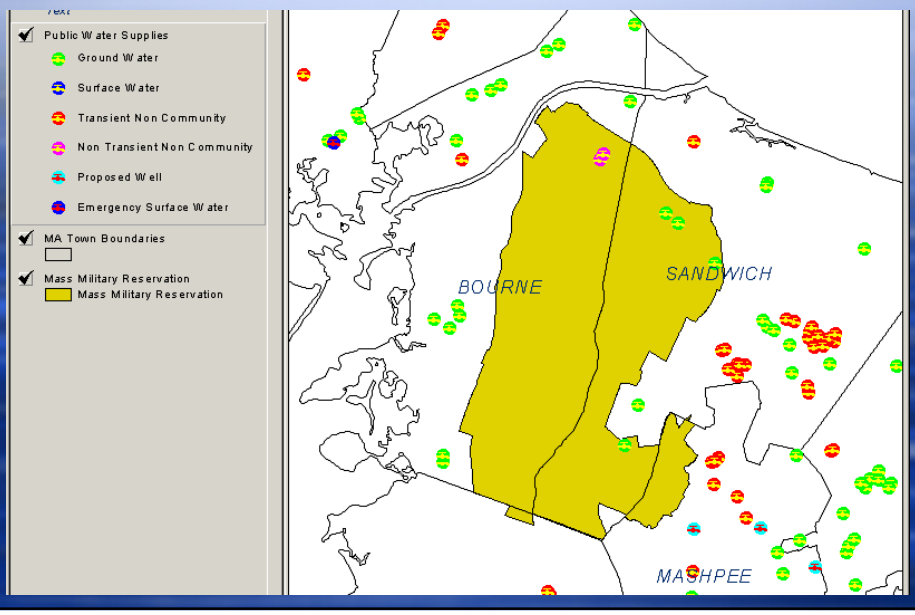
Analytical Methods

- EPA method 314.0, revision 1.0, November 1999 as modified to achieve the MRL of 1.0 ug/L (Ion Chromatography)
- EPA Method 314.1 (Ion Chromatography)
- EPA Method 331.0 (Liquid Chromatography Electrospray Ionization Mass Spectrometry (LC/MS or LC/MS/MS))
- EPA Method 332.0, (Ion Chromatography with Suppressed Conductivity and Electrospray Ionization Mass Spectrometry (IC/MS or IC/MS/MS))

Perchlorate in Massachusetts

- Massachusetts Military Reservation
  - Multi-Branch Base Located on Cape Cod
  - Superfund Site
- Perchlorate at Levels ≥ 300 ug/L in Groundwater
- 2001 EPA New England Established a "Relevant Standard" of 1.5 ug/L for use by the National Guard Bureau in its Evaluations of Groundwater Cleanup Alternatives at Camp Edwards
- Perchlorate Analysis Performed at MDL = 0.35 ug/L

Massachusetts Military Reservation



MassDEP Interim Drinking Water Advice

- MassDEP Recommends that Pregnant Women, Infants, Children up to the Age of 12 and Individuals with Hypothyroidism Do Not Consume Drinking Water Containing Concentrations of Perchlorate Exceeding 1 ppb
- Issued April 16, 2002, to the Bourne Water District
- Based on EPA's 2002 Draft Toxicological Review and Risk Characterization
- Later Modified to Advise the General Public Not to Consume Drinking Water Containing Concentrations of Perchlorate Above 18 ug/L
- Other Cape Cod Public Water Suppliers, Legislative and Executive Branch Press for Expansion of Interim Advice.
- September 23, 2003, MassDEP Commits to Promulgating both Cleanup Standards and a Maximum Contaminant Level

MassDEP Authority

- MGL c. 111. s. 160: The department may cause examinations of such waters to be made to ascertain their purity and fitness for domestic use, or the possibility of their impairing the interests of the public or of persons lawfully using them or of imperilling the public health. It may make rules and regulations and issue such orders as in its opinion may be necessary to prevent the pollution and to secure the sanitary protection of all such waters used as sources of water supply and to ensure the delivery of a fit and pure water supply to all consumers.
- 310 CMR 22.03(8): In the event the Department finds on the basis of a health assessment made by the Department's Office of Research and Standards that the level of any contaminant found in water collected within the distribution system and/or at the sampling point at the entry to the distribution system, pose an unacceptable health risk to consumers, acting alone or in combination with other contaminants, public water system shall take appropriate actions to reduce the level of contaminant concentrations to levels the Department deems safe or remove the source of supply from service by the deadline specified by the Department. The supplier of water shall be required to monitor the source as directed by the Department, provide public notification and notify the Department of the actions it intends to take in response to a finding that a source of supply poses an unacceptable risk to health.

Perchlorate and UCMR1

- September 17, 1999 – EPA's Unregulated Contaminant Monitoring Rule Included Perchlorate in List 1 Assessment Monitoring
- EPA's Contaminant Candidate List Considered Perchlorate's Occurrence to be "Highly Localized"
- 12 Month Period within January 1, 2001 - December 31, 2003
- March 2, 2000 – Approval of EPA Method 314.0 "Determination of Perchlorate in Drinking Water Using Ion Chromatography, Revision 1 (November 1999)" and Announcement of Laboratory Performance Testing Program
- 4 ug/L Minimum Reporting Level
- Two Rounds of Performance Testing during 2000
- Labs Must Hold Certification from Home State for an Inorganic Anion using an Approved IC Method

UCMR1 Results

	National	Massachusetts
PWS	3,870	133
Samples	34,728	1,153
Detections	647	1
PWS with Detects	160	1
Max	420 ug/L	6 ug/L
Mean	9.9 ug/L	6 ug/L

- Detect was in 1 of 4 Quarterly Samples at a Large, COM, SW PWS
- 4 ug/L MRL Does Not Support Regulatory Decisions Based on 1 ug/L Interim Advice Level

MassDEP Low Level Analysis

- Modified EPA Method 314.0 (Ion Chromatography)
  - Dionex Application Update 145, July 2003
- 1.0 ug/L Minimum Reporting Level with Additional QA/QC Requirements
- Initially Limited to Labs Approved by EPA for Perchlorate in UCMR1 but later Developed a Formal Certification Process
- By April 9, 2004, Seven Labs Approved
- Method Modifications Include: Improved Column, Low Noise Suppressor, Pretreatment Cartridges
- Performance Testing Supported 1.0 ug/L MRL
  - MDLs: 0.15 ug/L to 0.30 ug/L
  - Accuracy: 95 to 112 %
  - Precision: 3.4 to 10 RSD %
  - Matrix Conductivity Threshold: 430 uS/cm to 4500 uS/cm

Occurrence Round

- Based on UCMR1 Model
- February 27, 2004, MassDEP Promulgates Emergency Regulations to Require Monitoring at all COM and NTNC PWSs
  - SW – Quarterly, March through December
  - GW - April/September
- June 10, 2004, MA DPH Requires Bottled Water Monitoring
- Detection Confirmation Process
  - 24 Hour Confirmation Sampling
  - Rush Processing (3 Day)
  - Split Confirmation Sample Between Two Labs
  - MassDEP Review of Full Data Packages
  - Base Compliance with Advisory Level on Average

Results

- 446 COM and 246 NTNC (and 24 TNC)
- 3,529 Analyses
- 10 PWSs Confirmed Perchlorate Over 1.0 ug/L
  - 5 COM, 5 NTNC
  - Max from 1.51 ug/L to 1300 ug/L
  - Most Affected Systems Could Take Contaminated Wells Off-Line and Use Alternate Sources or Provide Bottled Water
  - 2 COM Add Ion Exchange Treatment to Wells
- Military and/or Aerospace Activities Not the Presumptive Source(s) in Any of these Cases.

Analytical Challenges

- Column Degradation due to High Conductivity Samples
  - Modified Method 314.0 Reported 44.4 and 32.2 ug/L
  - Reanalysis with 331.0 Reported ND
  - Confirmation Sampling with 314.0 and 331.0 Reported ND
  - GW Monitoring Wells (> 500 uS/cm)
  - Loss of Peak Resolution Caused False Positive Results
  - Solution: Require Method 331.0 or 332.0 when Conductivity > 500 uS/cm
- False Positives of Unknown Origin
  - Modified Method 314.0 Reported 2.14 to 459 ug/L
  - Reanalysis and Confirmation Sampling with 331.0 were ND
  - All MassDEP QC Met
  - Conductivity Below 500 uS/cm in All But One Case
  - Solution: Altered Confirmation Process to Require Method 331.0 or 332.0; Switch Specific PWS to these Methods for all Subsequent Monitoring

Analytical Recommendations

- Method 314.0 and 314.1 Remain Useful for Screening Purposes
- Confirm All Detections with Either Method 331.0 or 332.0
- Sufficient Lab Capacity and Comparable Cost Only Use Method 331.0 and 332.0

Sources of Perchlorate

- MassDEP Report at http://www.mass.gov/dep/cleanup/sites/percsour.pdf
- Blasting Materials
- Fireworks Displays
  - MassDEP Study at the University of Massachusetts Dartmouth http://www.mass.gov/dep/cleanup/sites/umdrep.htm
- Sodium Hypochlorite (Household Bleach, Drinking Water and Wastewater Disinfection)
  - NSF's Peter Greiner, Journal AWWA 100:11, November 2008
- Manufacturing (Biomedical, Air Bags, Road Flares, Fireworks)
- Military/Aerospace Activities
- Fertilizer (Chilean)

Pollution Prevention

Best Management Practices (BMP)

- BMP for Fireworks Displays
  - Local Fire Department Permits
- BMP for Blasting Operations
  - Local Fire Department Permits
- BMP for Treatment Chemicals

Current Status

- Samples: 10,523
  - 314.0: 8489
  - 314.1: 2
  - 331.0: 1446
  - 332.0: 586
- 483 COM, 295 NTNC, 85 TNC
- 9 MCL Violations (5 COM, 4 NTNC)

MassDEP Web Resources

- Perchlorate Page:
  http://www.mass.gov/dep/water/drinking/percinfo.htm
- Perchlorate Laboratory Page:
  http://www.mass.gov/dep/water/drinking/wespub03.htm
- "Perchlorate Toxicological Profile And Health Assessment"
  http://www.mass.gov/dep/toxics/perchlorate-toxicity-061206.pdf

Contact Information

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